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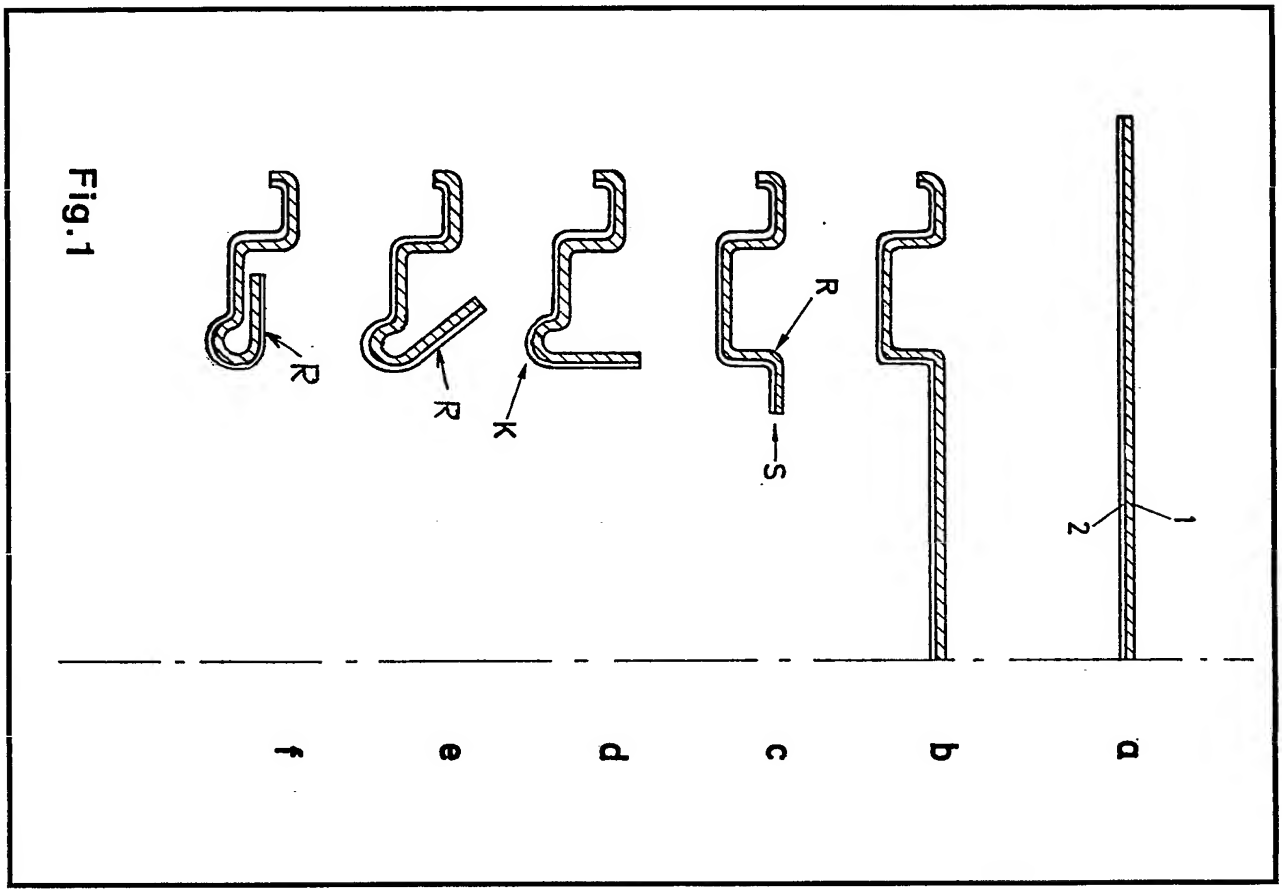
(54) Manufacture of closure rings for can ends

(57) A lacquered (2) peripheral closure ring for a can end, made of aluminium or tin-plate (1) and having an inner cut edge (S) turned outwards, is manufactured from a blank having no central opening. A lacquered sheet is deep drawn and a central opening is formed to produce the inner cut edge (S). The preform is shaped into the ring by stretching and turning over the material (R) adjacent the cut edge.



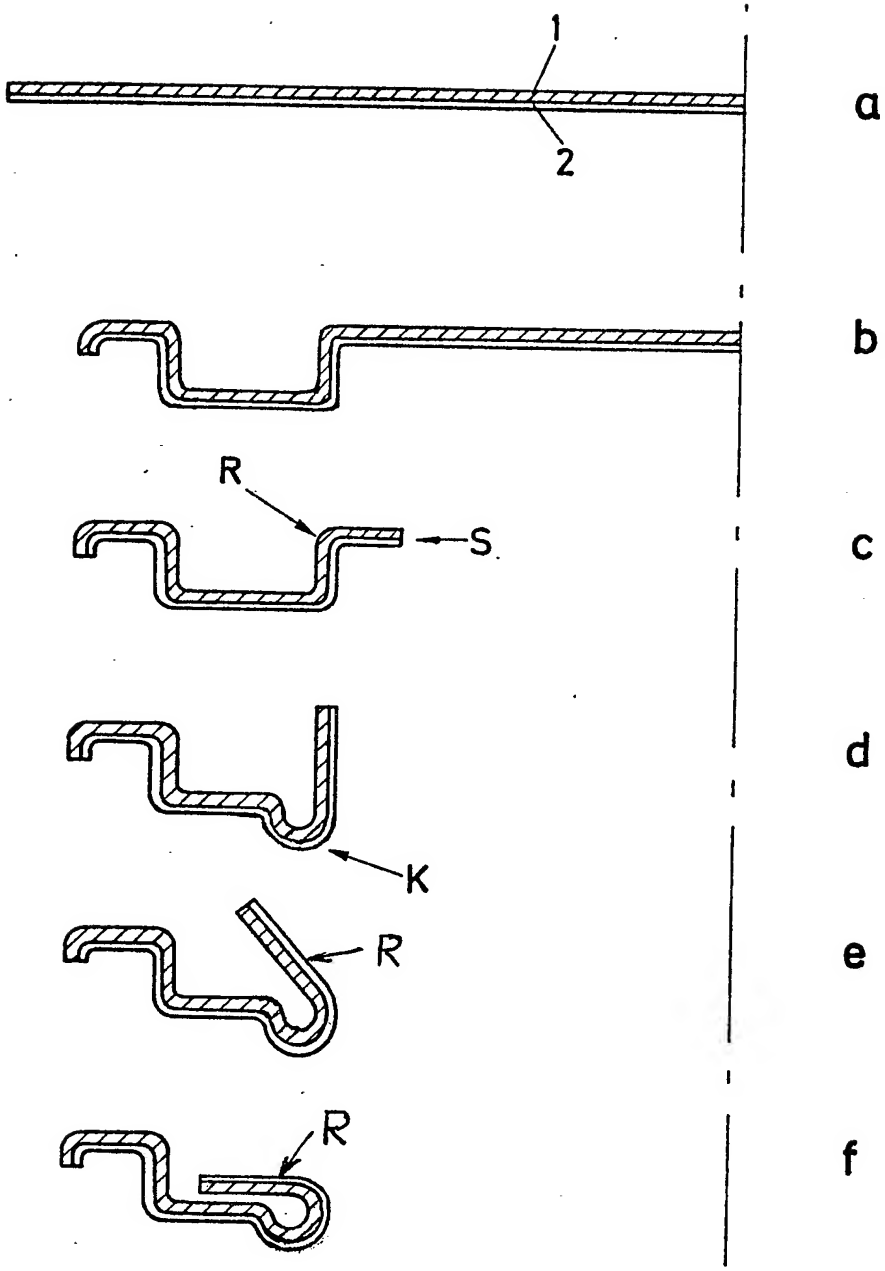


Fig.1

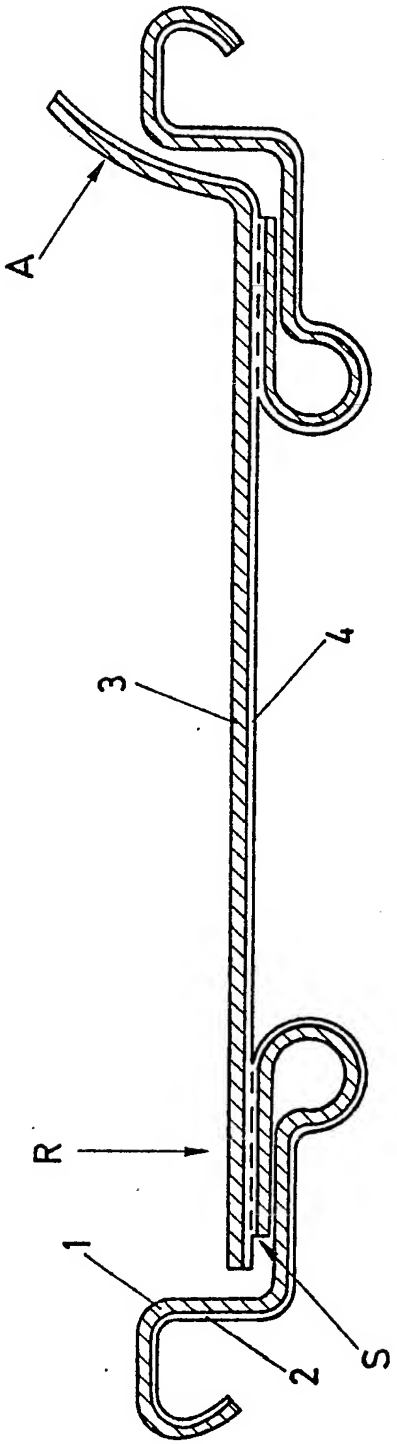


Fig. 2

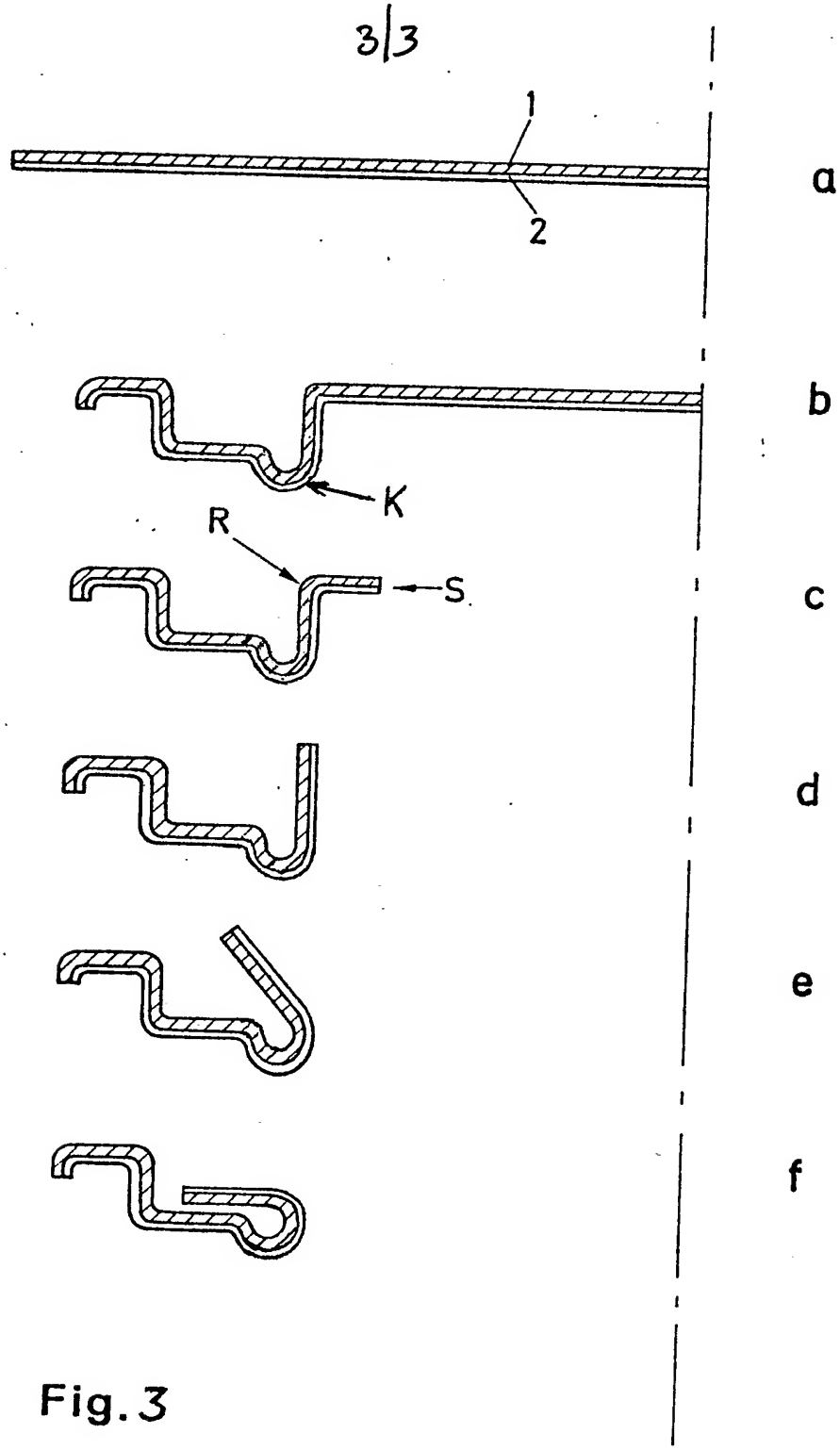


Fig. 3

SPECIFICATION

Processes for the manufacture of rings for ends of cans

The invention concerns a process for manufacturing lacquered peripheral rings of aluminium or tin-plate for the ends of food cans, wherein an inner cut edge of the ring is turned over outwards.

Today, cans are favourably priced containers which can withstand knocks and heavy handling, and may be used to hold a large variety of foodstuffs. Various opening systems have been developed to enable customers to open the cans without the help of any special tools.

There are for example ends made of aluminium or tin-plate which can be torn open along a line of weakness by means of a flap or a ring secured to a hollow rivet shaped out of the end. Such ends, which can also withstand sterilisation treatment, lead however to the exposure of sharp, cut edges which are a considerable hazard to the user. Furthermore, if the indentation forming the line of weakness is insufficient, then opening of the can is possible only by applying excessive force. On the other hand, if the indentation is too deep, then there is a danger of the end being penetrated accidentally. An end with a line of weakness is more sensitive to knocks, which could cause the can to burst open. Another disadvantage which must be taken into account is that failure of the material can occur due to corrosion at the line of weakness when the contents are aggressive. Such attack is known to occur preferentially in those regions where the material has been heavily deformed.

There are other ends which comprise a peripheral ring with a tearback membrane made of aluminium sealed to it. To reduce the risk of injury, the sharp edge around the opening in the ring, which results from the manufacture of the ring, is bent over into the interior of the cans. Such can ends have proved useful for cans containing dry substances. When the contents contain water on the other hand, in particular when the contents are aggressive, these ends are not suitable, as the cut edge which is turned into the interior is in contact with the contents. Consequently—in particular during a sterilisation process—the cut edge is exposed to corrosive attack which causes contamination of the contents and reduces their value. It is not technically possible today to apply a perfect lacquer coating subsequently to the cut edge, and furthermore, for economic reasons, would hardly be justifiable. Also, lacquering the cut edge would not reduce the risk of injury to the user on removing the contents from the can.

There are also light weight containers which are corrosion resistant, able to withstand sterilisation and are easy to open. These are made of aluminium coated in plastic and are closed via a sealed seam. The main disadvantage of such containers is their lack of rigidity.

The easily opened containers representing the state of the art today exhibit, besides their specific advantages, other not insignificant difficulties. The wish for a favourably priced, easily opened container which, after opening, does not exhibit sharp edges (which represent a risk of injury), can be sterilised, is corrosion resistant towards aggressive contents and is to a large degree resistant to mechanical damage, can be met with a can, one end of which comprises an aluminium tear-back membrane sealed to a peripheral ring. The cut edge of the ring, produced during the manufacture of the ring and delimiting the size of opening of the can, must be turned outwards and the tear-back membrane sealed to the edge which has been folded over.

It is in principle possible, after punching out the opening, to turn the cut edge outwards by bending it upwards and folding it over. It turns out however that this calls for a very small radius of curvature, as this process involves drawing the metal, i.e. the deformation is a result of elongation of the metal. Because the radius of curvature is small, the lacquer coating is damaged in the area which is sharply bent over. If the radius of curvature is increased, then the elongation properties of the metal are not sufficient to prevent tearing of the cut edge during the large increase in diameter which occurs there on bending over.

The inventors therefore set themselves the task of developing a process for the manufacture of lacquered peripheral rings for can ends, made of aluminium or tin-plate, with the inner cut edge turned outwards and suitable for sealing on of an aluminium membrane which can be pulled off.

This object is solved by way of the invention in that a blank with no central opening is made from lacquered sheet, is converted to a preform by deep drawing, and then, after making a central opening, the preform is shaped into the ring by stretching and turning over the cut edge.

The use of deep drawing for the production of the preform in terms of the invention makes it possible to manufacture a ring for can ends with the cut edge turned outwards, without causing the sheet or the stove lacquered coating to tear during the shaping operations. The reason for this is that on deep drawing before making a central opening, the material is necessarily drawn from the outer part of the blank to the deformation zone and therefore is required to stretch only slightly.

In one sequence of operations according to the invention the shaping of the preform into the ring commences with forming of a groove of rounded cross section having the radius of curvature of the section of the inner periphery

of the final ring.

In another sequence, the preform includes a groove of rounded cross section having the radius of curvature of the section of the inner periphery of the final ring.

Usefully, the radius of curvature lies in the range 0.6 to 1.0 mm, preferably at approx. 0.8 mm.

As the ring is used for ends of cans for foodstuffs, the lacquer is to advantage made of a phenolic, epoxy or phenolic-epoxy resin.

In manufacturing can ends with aluminium tear-back membranes which are easy to open and able to withstand sterilising, it is also of advantage if this lacquer can be sealed to polyamides.

A version which is able to withstand sterilisation particularly well is obtained, if the lacquer on the thin strip is made of phenolic epoxy resin and coated with polyamide 12. Such a version is consequently particularly suitable as a sterilisable closure for cans for foodstuffs.

It has also been found to be advantageous if the lacquer is made up of two layers, the first layer being an organosol e.g. an epoxy vinyl or phenolic vinyl organosol, and the upper layer a vinylcopolymeride. When manufacturing closures which are suitable for pasteurising and sterilising processes, the fact that this two-layer lacquer exhibits good sealing properties in combination with hot sealing lacquers—usually vinylcopolymers—is another advantage in that a tear-back membrane made of lacquered aluminium thin strip, coated with a hot sealing lacquer, e.g. a vinylcopolymeride layer, can be sealed onto the turned-over edge of a ring which bears the above mentioned two-layer lacquer coating.

A version which is able to withstand sterilisation particularly well is obtained if the lacquer on the thin strip comprises a first layer in the form of an organosol and on top of this a second layer in the form of a vinylcopolymeride. This version is also particularly suitable as a food can closure which is able to withstand parteurising and sterilising treatments.

The process of the invention will now be described in greater detail with the help of schematic drawings viz.,

Figure 1. The steps involved in one process for manufacturing peripheral rings for can ends. The view is in each case a cross-sectional view.

Figure 2. A cross-sectional view of a ring for a can end with a tear-back membrane sealed onto the ring.

Figure 3. The steps in a second process.

As shown in Fig. 1, a sheet 1 coated on one side with lacquer 2 is processed in the following series of steps to create a ring with the cut edge turned over outwards:

(a) Punching out a flat disc-shaped blank.

(b) The blank is then shaped into a preform by means of a first deep drawing process.

(c) The central opening is punched out, producing an inner cut edge S.

(d) The part R near to the cut edge S is straightened and a groove having in section the curvature K of the inner periphery of the final ring is formed by further deep drawing.

(e) The part R is bent outwards by stretching.

(f) The part R is pressed flat.

Fig. 2 shows a ring—made in accordance with a process similar to Fig. 1 from a sheet 1 coated with lacquer 2 on one side—fitted with a membrane, with a tear-back tab A and made of lacquered aluminium thin strip 3 coated with a layer of polyamide 4, sealed onto the said ring.

The advantages of the invention can be seen clearly from Figs. 1 and 2. A ring, which is exceptionally well suited for sealing-on of a membrane which can be pulled off, can be produced economically. Such a ring, fitted with a pull-off membrane, is particularly suitable as an easily opened closure for cans of food. With the cut edge turned outwards the problem of corrosion in contact with aggressive contents is eliminated and, at the same time, there is no danger of injury to the user.

The advantages of the invention will now be illustrated with the help of two examples.

Example 1

Aluminium thin strip 0.24 mm thick was coated with an epoxy-vinyl-organosol lacquer and then baked for 10 min at 200°C. The dry weight of the lacquer coating was 6 g/m^2. This product was then coated with a vinylcopolymeride containing a white pigment and then dried at 180°C for 2 min. The dry weight of this coating was 10 g/m^2.

Using a conventional transfer press, and a process as illustrated in Fig. 1, 73 mm diameter rings for cans were produced from this lacquered aluminium thin strip.

The radius of curvature at K (Fig. 1) was 0.8 mm.

There were no cracks or tears, in the final ring. On testing the lacquer for cracks and pores, it was found that it was still fully intact, even at places which had undergone the greatest deformation.

Example 2

A sheet of tin-plate 0.22 mm thick was lacquered in the same manner as in Example 1.

Using the same process as in Example 1, rings were produced from this lacquered tinplate. These rings were rectangular in shape, the lengths of the sides being 210 and 130 mm, and the corners had a radius in plan of 35 mm. The radius of curvature at K (Fig. 1) was 0.8 mm.

There were no cracks in the finished ring. On testing the lacquer for cracks and pores, it was found that the lacquer had not been

damaged anywhere on the ring.

In the process shown in Fig. 3, the steps are:—

(a) Punching out a flat disc-shaped blank.

(b) The blank is then shaped into a preform by means of a first deep drawing process, which includes formation of a groove having in section the curvature K of the inner periphery of the final ring.

(c) The central opening is punched out, producing an inner cut edge S.

(d) The part R near to the cut edge S is straightened.

(e) The part R is bent outwards by stretching.

(f) The part R is pressed flat.

CLAIMS

1. A process for the manufacture of a lacquered peripheral ring for can ends, made of aluminium or tin-plate and having the inner cut edge turned outwards, in which a blank with no central opening is made from lacquered sheet, is converted to a preform by deep drawing, and then, after making a central opening, the preform is shaped into the ring by stretching and turning over the cut edge.

2. Process according to claim 1, in which the shaping of the preform into the ring commences with forming of a groove of rounded cross section having the radius of curvature of the section of the inner periphery of the final ring.

3. Process according to claim 1, in which the preform includes a groove of rounded cross section having the radius of curvature of the section of the inner periphery of the final ring.

4. Process according to claim 2 or claim 3, in which the radius of curvature is in the range from 0.6 to 1.0 mm.

5. Process according to any of claims 1 to 4, in which the lacquer comprises phenolic, epoxy or phenolic-epoxy resin.

6. Process according to claim 5, in which the lacquer can be sealed to polyamides.

7. Process according to any of claims 1 to 4, in which the lacquer is made up of two layers where the first layer is made of an organosol and the layer on top of this is a vinylcopolymeride.

8. Process according to claim 7, in which the two-layer lacquer can be sealed to hot sealing lacquers made up essentially of vinylcopolymerides.

9. A ring for can ends manufactured in accordance with the process in claim 6, having a membrane of lacquered aluminium thin strip coated with a layer of polyamide sealed onto the bent-over edge of the ring.

10. A ring for can ends according to claim 9, in which the lacquer on the thin strip comprises a phenolic-epoxy resin which is coated with polyamide 12.

11. A ring for can ends, manufactured in accordance with the process in claim 8, having a membrane of lacquered aluminium thin strip, coated with a layer of hot sealing lacquer comprising essentially vinylcopolymers, sealed onto the bent-over edge of the said ring.

12. A ring for can lids according to claim 11, wherein the lacquer on the thin strip comprises a first layer of an organosol and on top of this a layer of a vinyl-copolymeride.

13. Use of a ring according to any of claims 9 to 11 as a closure for cans able to withstand pasteurising and sterilising treatments.

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